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AIR FORCE PACKAGING EVALUATION AGENCY WRIGHT-PATTERSON--ETC F/G 13/4  
PERFORMANCE EVALUATION OF MODIFIED TYPE IV (X63) FAST PACK, (U)  
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6 PERFORMANCE EVALUATION OF MODIFIED TYPE IV (XG3) FAST PACK.

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## ABSTRACT

In support of SM-ALC/DSTE, a proposed Type IV, XG3, modified Fast Pack container was evaluated. The modification to the Fast Pack involved the replacement of the polyurethane cushion material with polyethylene foam material of the same structural configuration.

Test results revealed average shock transmission ranging between 20 to 30 Gs. This compares favorably with the force experienced by lighter weight items packaged in standard fast packs.

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## INTRODUCTION

An additional Type IV Fast Pack was proposed for incorporation into the Air Force packaging system. This pack was designed to accommodate items weighing between 45 and 140 pounds. SM-ALC/DSTE designed a modified pack which measured 24 x 20 x 16 inches (I.D.) and used 2 pcf polyethylene cushioning cut in the same horizontal star configuration as the standard type IV fast pack. This container provided a low shock transmission; however, the items packed in it would be limited to a very narrow range of cross sections due to the somewhat rigid, compression characteristics of the polyethylene cushion material.

## PACK DESCRIPTION

The container was of a half telescope construction fabricated from triple wall fiberboard conforming to Federal Specification PPP-F-320, WR grade 1100 TW.

Interior dimensions were 24 inches long, 16 inches wide, and 20 inches high

Polyethylene foam cushioning material of 2.3 lbs/cu. ft. density was cut in a star configuration whose outer diameter, (star point to star point), was measured at 15.5 inches. The inside diameter, at the base of each star point, was measured at 9 inches. Cushion thickness, measured from the tip of the star point to the container side walls was 2 inches for the top and bottom cushions and 1 inch thickness for each side cushion. End cushions were 3 inches thick.

## TEST EQUIPMENT AND INSTRUMENTATION

The following equipment and instrumentation were employed for this evaluation:

1. Gaynes Drop Tester.
2. Oscilloscope, Tektronex, 4 channel, Model 564B.
3. Accelerometers, Tri-axial, Endevco Model 2233E.
4. Power Supply, Endevco Model 2622C.
5. Amplifier, Endevco Model 2614C.

## TEST LOADS

Simulated test loads were constructed of 3/4 inch plywood discs assembled by inserting 4 steel rods thru the length of the load. Dimensions and weights of the test loads are presented in the following table:

SIMULATED LOAD				CARTON
LOAD DESIGNATION	DIAMETER (Inches)	LENGTH (Inches)	WEIGHT (Lbs)	GROSS WEIGHT (Lbs)
A	8	15	46	61.5
B	8	15	85.5	101.0
C	10	18	102.0	117.5
D	10	18	142.0	157.5

TABLE 1

Triaxial accelerometers were located at the geometric center of each simulated load.

#### TEST PROCEDURES

Free fall drop tests were accomplished in accordance with Federal Test Method Standard 101B, Method 5007. The drop heights used in the tests are listed below in the Results section.

#### RESULTS

The free fall drop test results are presented below:

TEST RESULTS					
LOAD DESIGNATION	DROP HEIGHT (Inches)	SHOCK TRANSMISSION (Gs)			AVERAGE
		Face 1-3	Face 2-4	Face (End) 5-6	
A	30	35.68	28.27	23.83	29.26
B	21	23.50	21.56	17.42	20.83
C	21	17.84	22.79	25.14	21.92
D	18	17.02	24.07	22.05	21.04

No shock transmission greater than 36 Gs was observed during the test series. The condition of the container at the completion of the test series, of 72 drops from various heights and throughout the complete weight range, was excellent. Slight tearing of the cushioning was noted. This was caused by the threads of the bolts used in the assembly of the test loads. No interior damage of the carton was observed.

### PROCUREMENT COSTS

In 1978 SM-ALC/DSTE estimated total cost of the modified Type IV Fast Pack to be \$35.47 as shown in the table below. These estimates do not include overhead and profit; however, this estimate does include a 10% material waste factor.

ESTIMATED PROCUREMENT COSTS				
Material Costs		Direct Labor Costs		Total
Ethafoam cushion	\$27.89	Foam Cutting	0.91	
DW Fiberboard	3.53	Foam Laminat	0.22	
Adhesive	.76	Pack Fabrication	2.16	
Staples	.10			
TOTAL	\$32.28		\$3.29	\$35.47

### CONCLUSION

The average shock transmission of the modified Fast Pack at all weights and drop heights was found to be 23.3 Gs. Reference is made to Appendix G of MIL-STD-794D which indicates most items in the Air Force inventory would be provided suitable protection by this pack.

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